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AMSAT SATELLITE REPORT

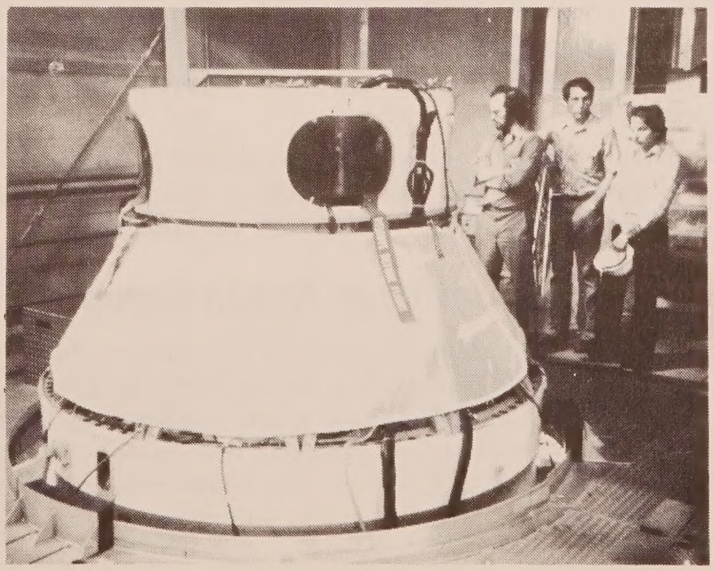
"UoSAT Delayed On Space Junk Issue"

In a late breaking story, AMSAT Officials learned 11 Sept. that the launch date then planned for the 20th of September had been cancelled. The reasons for the delay varied according to the source. What all seemed to agree on was that the reason had to do with the issue of "space junk." In the approximately 24 years that nations have been placing manmade objects in orbit around Earth, a shocking pollution of the environs has occurred. Literally tens of thousands of bits and pieces of junk left over from the hundreds of launches still orbit the planet. While this is probably not a major concern to most of us terrestrials, except when an inordinately large chunk of hardware falls out of the sky (as did Skylab a couple of years ago), certain folks are *always* worried about this mass of orbiting hardware. And it is these folks who worry a lot together with some others who think a lot who have caused the UoSAT schedule to slip.

As you've probably guessed, those folks who worry a lot are not members of the "Chicken Little Society" but rather those agencies of government whose responsibility it is to insure the security of the nation. Foremost among these is the group called Spacetrack. Working for the United States Air Force through the North American Aerospace Defense (NORAD) Command, Headquartered at (under) Cheyenne Mountain, Colorado Springs, Colorado, the Spacetrack folks are charged with cataloging, classifying and tracking all this hardware in orbit. Besides the mostly innocuous spent booster stages, tanks and farings, there are the active communications satellites. Then too there are the reconnaissance satellites of the optical and RF variety. For the present, the latter variety comes in both active and passive types. There are the active radar types which, for example, watch shipping on the world's oceans. A nuclear-powered radar satellite owned and operated by the Soviet Union burnt up while deorbiting over Canada causing a bit of a ruckus and some considerable embarrassment for the owners. The passive variety just sit out there and listen. Finally, there are the most sinister of the present breed of satellites: the so-called "killer" satellites. It is these new entries to the space arsenals of the superpowers that has both sides watching very carefully not only the new objects placed in orbit on a permanent basis but tests of short-lived killer satellites which can attack virtually any other satellite in a few orbits and literally blow it from the sky. It is these vehicles in particular that cause concern since so much of present military communications is carried by birds using the acronyms DSCS, FLTSATCOM, and nicknames like Big Bird, KH-11, etc. In short, major Command Control Communications and Intelligence (C^3I) channels are threatened by, on the one hand the growing sophistication of offensive space weaponry and on the other hand with the growing difficulty of keeping track of thousands of objects in orbit. The problems faced by defense planners then, is akin to that of the sheep farmer knowing there's a fox in his flock but not knowing just where. Similarly, with all the space junk floating about, it is becoming increasingly complex (and thus expensive) to tell the good guys from the bad; the sheep from the foxes.

Just how complex and expensive it has become is reflected in regulations levied on U.S. launch Project Managers that they fly their missions so that the spent stages and miscellaneous hardware are placed in an orbit that will rapidly decay, i.e., are promptly returned to Earth thanks to gravity. If the junk falls out of the sky in

Top of 2° stage of Delta 156 where UoSAT & SME will be mated. Left to right: Ian Ferebee, G6BTU (UOS-AMSAT UK); Jan King, W3GEY (AMSAT); Jerzy Slowikowski (UOS-AMSAT UK).



a few weeks to a few months everyone should be happy. In the past, unfortunately, much of the junk went into long-lived orbits. Maybe this junk can be used as target practice for some of the less beneficent breed. The extra risk and cost involved in assuring the rapidly decaying orbit for the space junk is justified in terms of the risk and cost of tracking a few dozen to several score new artifacts every time a new bird goes up depositing refuse along the way. Space is becoming a country road littered with proverbial beer cans.

The mandate to "clean up your act" has been levied on SME/UoSAT. What this means is that the Project Manager for Solar Mesospheric Explorer (SME; the primary payload) must restart his third stage engines and position the thrust vector such that the stage is promptly deorbited. What SME folks are very concerned with, however, is the spacing between the SME satellite and the third stage when the latter is relighted. Program Officials are dissatisfied with the one kilometer spacing previously programmed and are now set to increase that distance. How long the program software changes will take is just guesswork. At presstime it appeared that about two weeks would be adequate to implement the changes and to thoroughly test the software.

If the two-week delay were true, that would place the launch at about the first week in October. AMSAT Officals were quoting a date of 28 or 29 Sept. on the Nets 13 Sept. as "talking dates" with the admitted optimism associated with wanting to get launched soon. Other estimates are more gloomy One account points out that if the launch slips into October, it will begin to compete for resources with the coming launch of Shuttle. Much of the tracking network used for SME/UoSAT must be configured for Shuttle. Thus, it appears possible that should UoSAT slip into October, it might have to stand down for the Shuttle and wait until late October for its turn. Where the delayed SBS launch and others in the queue stand now is not certain.

AMSAT Officials expressed dismay at the delay but again pointed out that this is really quite normal in space launching business. One optimist who would not be quoted suggested that if the delay proved to be a long one and the SME Project people wanted to do some last minute tweaking on their bird, AMSAT might be afforded the opportunity to do the same and might be able to effect a "fix" for a CCD noise problem.

Regarding the actual launch date, again the best advice is to stay tuned to the AMSAT Nets for the latest estimates.

Editors Note: As we go to press the UoSAT launch "talking dates" are now approximately 4 Oct., before the Shuttle launch. Check AMSAT Nets for updates.

PAØDLO Continues Net In Europe

Nico Janssen, PAØDLO, reminds *ASR* readers that he chairs a regular AMSAT Net on weekends specifically aimed at Europeans. Nico's net meets on Saturdays, 1000 UTC, with a frequency of 14280 kHz. AMSAT encourages all members and *ASR* readers alike to participate in the world-wide net activities and to support dedicated individuals such as PAØDLO.

SANDARC Donation Detailed

Thanks to a lot of legwork and fine public relations effort by Herb Gordon, W6KBD, AMSAT coffers will be $2000 fuller. SANDARC is the San Diego County Amateur Radio Council. Herb's diligent efforts in demonstrating a need and justifying AMSAT's worthiness resulted in a cash contribution of $1000 to the ARRL Foundation from SANDARC for the Amateur Space Program. Through the ARRL's matching funds, the SANDARC donation will yield $2000 for the advancement of AMSAT projects. Our sincere thanks to SANDARC, W6KBD, N6TE (who presented the check) and to ARRL.

"Space Program" Retro-Launch

Regulars on the weekend AMSAT nets from the U.S.A. have noticed a prominent voice missing lately. W6SP, AMSAT Chairman of the Board, has been noticeably absent. Fortunately, John is in good health so his absence is not attributable to an illness. Unfortunately, the same cannot be said for John's tower and antennas! It seems that John's beautiful 70 foot (21 meter) crank-up tower decided to crank down at a totally imprudent velocity. And, as the familiar expression goes, it was not the speed which hurt but rather the sudden stop at the end! The three mono-banders atop the tower (which held the 20 meter beam at 90 feet and the 15 and 10 meter beams below) suffered moderate to heavy damage and the tower was badly damaged too. This type of tower uses telescoping sections connected by heavy steel cables and is self-supporting, requiring no guys. John was operating the electric winch which hoists the upper sections when he heard a cable snap. He quickly took shelter under an overhang next to the garage and thus was protected from the rain of aluminum antenna parts which showered down moments later as the structure hit bottom. John says the neighbors, sensitized to strong vibrations in this earthquake risk area, thought this was IT. As for the cause, John indicates the autopsy report is incomplete but attending physicians strongly suspect salt spray from the nearby Pacific erroded the hoist cable. W6SP says that the array will be rebuilt soon and that's good news for most of us who enjoy listening to and chatting with "Double-You-Six Space-Program."

New NCS Steps Forward

With the untimely passing of W6DOW (See *ASR* #15), a need for a new, permanent NCS for the 75 meter AMSAT Pacific Coast Net appeared. W6CG has graciously stepped forward to try to fill Karl's position. W6CG will be erecting a 75 meter inverted V to allow better coverage in the West from his Anaheim QTH. Bud will be supported in the NCS chores on occasion by W6SP and others.

AO-8 Reference Orbits

22 Sept.	18086	01:01:24	79.1
29 Sept.	18184	01:33:44	87.3

ASR *Spotlight On: UoSAT (Getting to Know You)*

For the next several weeks *ASR* will dedicate its "Spotlight" column to getting to know the UoSAT better. Many articles are being prepared on the new OSCAR and others are already in print. *ASR* will devote this column to carrying some of the specifications for the various subsystems on board. Other *ASR* articles (such as the one which led #13) will focus on the implications and interpretations of some of the experiments. This issue will concentrate on the following subsystems: a) Power; b) Telemetry; c) Data Beacons.

We are indebted to the UoSAT Program Office and G3YJO for the following data quoted from UoSAT Spacecraft Technical Data Summary, August 81.

Power Systems: *(Dr. Karl Meinzer, Univ. Marburg AMSAT-DL, Germany, Jerzy Slowikowski, UOS-AMSAT, UK)*

Four solar arrays each of 408 2x2 cms cells fabricated by SOLAREX Corp. (USA) provide 28 watts each at a nominal 32 volts when fully illuminated. The total average power available from the arrays, allowing for sun angle and eclipse periods, will be around 17 watts. One of two redundant Battery Charge Regulators (BCR) regulates the solar array power to the 14v 6 AH 10 cell NiCd battery with an efficiency of approx. 90% whilst the Power Conditioning Module (PCM) delivers regulated power supplies of +10v (1%), −10v (5%), +5v (5%) with a total capacity of 10 watts and with an overall efficiency of about 87%. The average continuous power budget available to the spacecraft electronics from the battery bus and PCM is around 11.5 watts.

The spacecraft consumes around 9.8 watts from the PCM when all experiments are operational with a further 10.5 watts from the unregulated battery bus. Power is distributed around the spacecraft through a central Power Distribution Module which, under the control of the Command System, provides switched power supplies to the various experimental & service modules whilst also allowing central telemetry monitoring facilities. The power switches exhibit resettable current fold-back in the event of malfunction.

Telemetry: *(Dr. Lui Mansi, UOS-AMSAT, UK)*

The Telemetry system has been deliberately designed to cater for a wide range of user ground station facilities and to provide a high degree of flexibility.

60 analogue channels and 45 digital status points are monitored around the spacecraft, encoded and are available for transmission via the VHF, UHF and SHF beacons in the following formats:

1200 baud ASCII	45.5 baud rtty
600 baud ASCII*	
300 baud ASCII*	10 or 20 wpm morse code (Channels 00 to 09 only
110 baud ASCII	
75 baud ASCII*	Synthesised voice (in conjunction with the primary s/c computer)

The telemetry ASCII format is: 1 start, 7 data, even parity bit, 3 stop bits.

The formats marked * are options on the 1200 baud output and are not available simultaneously. Any selection of the primary formats are available to the UHF and VHF data beacons simultaneously, with the data format on the 2.4 GHz SHF beacon being that currently selected for the VHF data beacon.

The 1200 baud family also have the facility to dwell on any selected analogue channel.

The analogue telemtry channels have an encoded resolution of 0.1% and an accuracy of 2%, however the high current measuring channels suppress the least significant digit.

It is anticipated that the two VHF and UHF data beacons will carry different data formats to cater for the widest possible audience.

Data Beacons: *(Bob Haining, UOS-AMSAT, UK)*

Two VHF and UHF beacons provide the primary engineering and experiment data links to the outside world and have been designed to provide a healthy satellite-to-ground transmission link to enable reliable and straight-forward reception by the simplest of ground stations. A standard, unmodified n.b.f.m. VHF or UHF amateur receiver and a small, fixed, crossed-dipole antenna should suffice to gather data from most orbit passes. The addition of a +10dB gain yagi steerable in azimuth only would provide coverage of the low elevation passes. The data sources available to these beacons are:

Telemetry: ASCII - Baudot - Morse code
Primary s/c computer: serial o/p port no.1 - serial o/p port no. 2
Speech Synthesiser
Video Display Expt: Camera Image Data - Text/ news/schedules/graphs

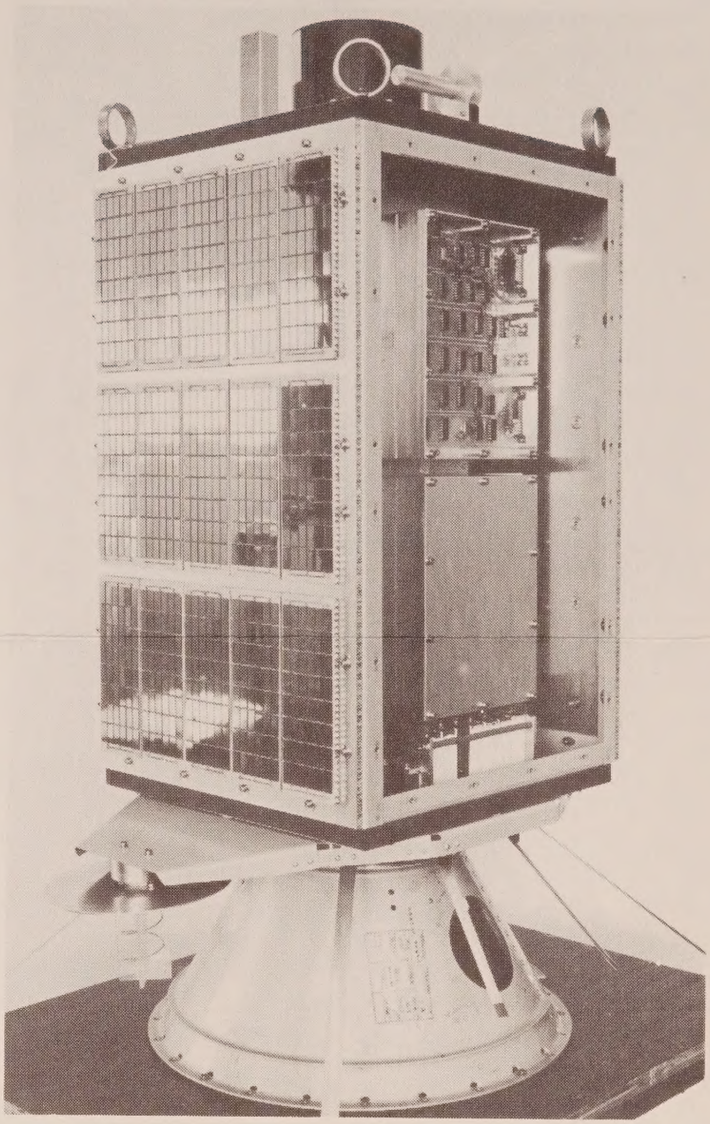
General Data Beacon:
Frequency: 145.825 MHz Power output: 350 mW
Modulation: n.b.f.m. ±5kHz devn. Total dc/rf efficiency: 45□
Unwanted signal levels: Greater than −65 dB ref. carrier max.
doppler: ±3.1 kHz

Engineering Data Beacon:
Frequency: 435.025 MHz Power output: 650 mW
Modulation: n.b.f.m. ±5kHz denv. Total dc/rf efficiency: 40%
Unwanted signal levels: Greater than −65 dB ref. carrier max.
doppler: ±9.3 kHz.

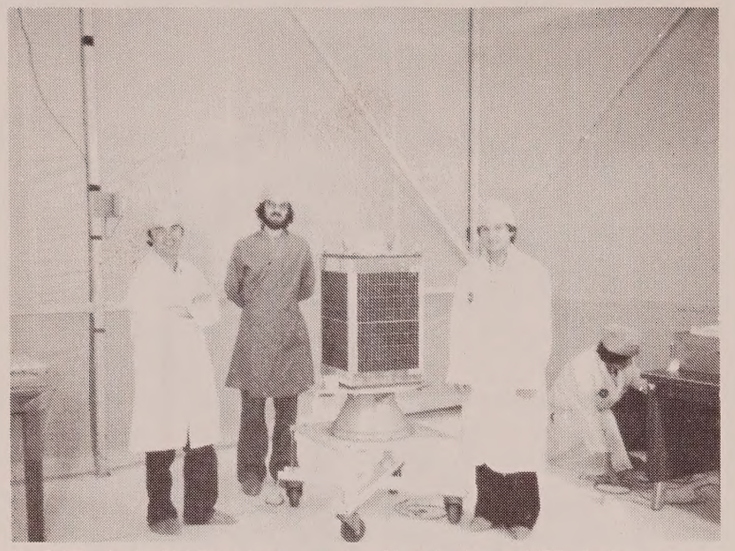
Data Transmission Formats:

High speed data at 1200 bps from the telemetry, computer and video display expt. are transmitted as phase-synchronous a.f.s.k. using 1200 Hz ('0') and 2400 Hz ('1') synthesised tones. The '1' - '0' data transitions occur at the zero crossings of the tone waveforms thus reducing the dc component of the data modulation spectrum and resulting in exactly one cycle of 1200 Hz representing a data '0' and exactly two cycles of 2400 Hz representing a data '1'. This method lends itself to quite simple but effective decoding techniques.

Data at speeds other than 1200 bps are transmitted asynchronously using 1200 Hz ('1') and 2400 Hz ('0') tones, except morse code in which a 1200 Hz tone only is employed.



UoSAT with one solar panel removed.



UoSAT s/c in NASA cleanroom at Vandenberg AFB. Left to right: Martin Sweeting, G3YJO; Ian Ferebee, G6BTU; Jerzy Slowikowski; Christine Sweeting, G6APF

More Satellite "Firsts"

Two recent QSO's added to the list of accomplishments on AMSAT-OSCAR 8. In *ASR*#15 we reported that WA6VGS had claimed the first ever Mode J W.A.S. (Jack received W.A.S. #50 (J #1) on 8 Sept. from ARRL, see photo). More recently W7UFE claims to have made his J W.A.S. and will be submitting his QSLs for verification soon in hopes of getting #2 J W.A.S.

Now comes reports of even more DX "firsts" on AO-8J. W1HEO, Dee Logan, reports that on 9 Aug. 81 W1NU QSO'd VP9IB for the very first J contact between Bermuda and the mainland. Finally, in early September, W4AUZ, Shep, worked GM4IHJ, John, on J. Shep believes that that J QSO had to be one of the best DX ever on the J Mode. (Shep is in Lexington, KY.) Can anyone top that one?

ALINS Expands Again

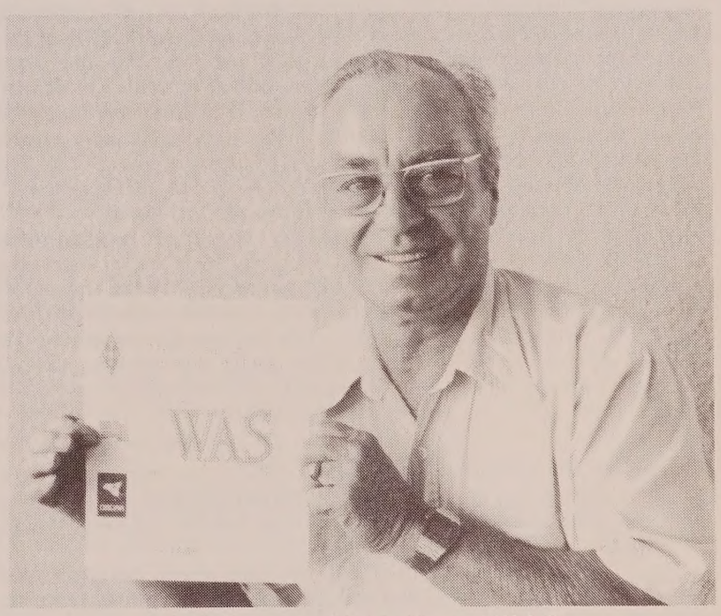
Plans for the AMSAT Launch Information Network used to support the UoSAT launch now includes a host of additional stations and frequencies. Also, the details of the telephone network used to link the various amateur HF transmitter sites together were revealed last week.

The new stations include K3DML which will be transmitting the 21280 kHz signal for European coverage from Rockville, Maryland. On 7177 kHz will be found W3VD also from Maryland. A final addition will be the Vandenberg AFB Amateur Radio Club station, W6AB, which will transmit from the actual launch site on 14315 with a beam heading of 090° for the best coverage in eastern U.S. and Caribbean. Previously announced were ALINS stations WA3NAN, 14282, Europe; W6VIO, 14305 and 7182, Asia/Pacific; WA2LQQ, 28877, Europe. Originating in England will be stations transmitting on 3780 and 7080.

The telephone system used to link the NASA audio feed from the AMSAT-OSCAR Spacecraft Laboratory at the Goddard Space Flight Center to the various ALINS sites will be provided by A.T.&T. (Long Lines) thanks to the fine work of Bob Ruedisueli, W4OWA. The dual bridges being used for the audio patch (conference bridges) will be under Bob's control and supervision. All taps will be fully amplitude compensated and equalized to provide the ALINS listener with the best possible audio. AMSAT wishes to thank Bob and A.T.&T. in advance for the excellent level of support and for the spirit of cooperation evidenced in advancing AMSAT's public service charter.

AMSAT OSCAR Patches Announced

AMSAT's Los Angeles Area Coordinator Jack Somers, WA6VGS, announces that the sew-on, embroidered patches for jackets and caps are now available. The colorful patches features the AMSAT logo and the Project OSCAR organization name in a colorful patch. Order from WA6VGS, P.O. Box 49751, L.A., CA 90049. Price is $3.50 each. Please make checks payable to AMSAT. Proceeds go toward AMSAT's programs. We thank Jack for developing another winner. Jack developed the callsign badge project which, now being managed by Kay Skoog, WD0EEL, has resulted in more than $2000 for AMSAT. Thanks to Jack and Kay!



Jack Somers with his Mode J W.A.S.

Once An Engineer, Always A Plumber

Speculation abounds as to what W3GEY is shown doing in the photo appearing on page 4 of *ASR*#15. One pundit suggested Jan was praying for a better vintage from the god of the grapes! Ken Frank, WB5AKI, submitted the most cogent suggestion. Ken says that "W3GEY is using the bottle & line for a "plumb bob." Sorry, Ken! Nice try but no cigar. Besides, who ever said that cogency was a virtue in these matters!?! To "up" the ante a bit, AMSAT will award a Ham's-In-Space Sweatshirt, (yep that's right, I said sweatshirt) to the first individual who can guess the purpose of the bottle. AMSAT Officials who were at the test facility are automatically disqualified (on any one of scores of accounts, Hi).

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